A new approach for routine and accelerated processing of microplastics using MPScanTool plugin for ImageJ

William De Haan[*1], Miquel Canals[2], and Anna Sanchez-Vidal[†1]

[1]Department of Earth and Ocean Dynamics – E-08028 Barcelona, Spain
[2]CRG Marine Geosciences, Department of Earth and Ocean Dynamics, Faculty of Earth Sciences, University of Barcelona – E-08028 Barcelona, Spain

Abstract

Plastic pollution has become a major threat to marine and terrestrial organisms and habitats worldwide. In particular, the study of microplastics ($<$ 5 mm in length) in different environmental matrices often requires routine quantification, measurement and classification, especially during the analysis of high-throughput monitoring data. However, most of current protocols rely on time-consuming and manual counting and classification of microplastics, which enhances the potential for errors and biases. To address this problem, we propose a novel simple and inexpensive method for accelerating laboratory processing of microplastic samples using a modified common flatbed scanner coupled with a custom-built and open-source ImageJ/Fiji macro plugin, named MicroPlastic Scan Tool (MPScanTool). By the superposition of bright-field and dark-field scans, and precise image alignment, we achieve major accuracy ($> 90\%$) to detect microplastics down to 0.15 mm in length at a 1200 dpi (47.2 pixels mm-1) scan resolution, and are able to differentiate between transparent or translucent and opaque microplastics in 95% of the cases. By color calibrating the flatbed scanner (i.e. by means of an IT8.7 Target) and using standard color charts we achieve a standardized color classification of microplastics with 92% of accuracy at an average processing rate of 300 plastics/minute. An integrated supervised classification algorithm (i.e. Random Forest model) is used to classify microplastics into 6 most common categories (i.e. fragments, films/sheets, filaments, foam, pellets, microbeads) with $> 90\%$ accuracy. MPScanTool provides semi-automatic counting and particle categorization of microplastic samples and automatic file management, data processing, color determination and microplastic category classification thus accelerating microplastic sample processing, improving data quality and reducing visual subjectivity during sample treatment. Over 100,000 plastics have been analyzed in recent years employing our method (e.g. see *Surfing for Science* project), and can be used to accelerate monitoring campaigns in the future while increasing data thorughput.

Keywords: classification, imagej, digitalization, processing, microplastics

---

[*]Speaker
[†]Corresponding author: anna.sanchez@ub.edu